who considers that M. Renard has mistaken sponge-spicules for crinoid stems.*

In conclusion, it may be asked what is the evidence which Dr. Hinde can assign for his statement—that the silica of Carboniferous chert has been derived from sponge-spicules? Absolutely none, except a fanciful analogy between these peculiar masses and the sponge-beds of the Cretaceous formation. On the other hand, it has been shown that no such analogy exists, inasmuch as there was a marked contrast between the organic beings in the waters of the Carboniferous seas as compared with those of the Cretaceous period. In the former siliceous sponges were exceedingly rare; in the latter they abounded; so that, whatever part they may have played in the construction of the Cretaceous bands of chert, it is clear they could have taken no important part in the formation of the chert-bands of the Carboniferous Limestone. The relative weight of opinion as expressed in the papers dealing specially with this subject must be left to individual judgment; in forming this judgment, however, it will not be overlooked that identical conclusions have been arrived at regarding the mode of formation of the Carboniferous chert-bands by two sets of observers working independently, one in Ireland the other in Belgium, almost at the same period, and both using chemical and microscopical appliances.

I trust, therefore, that I have succeeded in showing that there are good grounds for the opinion of those who consider that the beds and nodules of siliceous material in the Carboniferous Limestone have been formed by a direct replacement of original calcareous matter of the limestone itself by silica held in solution in the ocean-waters, and that, consequently, Dr. Hinde is not justified in referring them for their origin to sponge-structures.

II. "Note on Professor Hull's Paper." By Edward T. Hardman, of the Geological Survey of Ireland. Communicated by E. Hull, F.R.S. Received April 5, 1887.

Dr. Alleyne Nicholson, a palæontologist of no small repute, refers to this subject in his work on the 'Ancient Life History of the Earth,' p. 34. He considers that the silica which has surrounded and infiltrated the fossils which flint contains, must have been deposited "from sea-water in a gelatinous condition, and subsequently have

* Dr. Hinde's words are: "There are shown, however, in one of the figures (fig. 2) accompanying M. Renard's paper, circular sections which more nearly resemble those of sponge-spicules than of crinoid stems, to which they are assigned." Note, *loc. cit.*, p. 433.

hardened." Also that "the formation of flint may therefore be regarded as due to the separation of silica from sea-water, and its deposition round some organic body in a state of chemical change or decay."

This is essentially the theory I advanced in our joint paper, and that independently arrived at by the Abbé Renard, namely, pseudomorphism.

Dr. Nicholson says further: "It has been asserted that the flints of the chalk are merely fossil sponges. No explanation of the origin of flint, however, can be satisfactory, unless it embraces the origin of chert in almost all limestones from the Silurian upwards, as well as the common phenomenon of the silicification of organic bodies (such as corals and shells) which are known *with certainty to have been originally calcareous.*"

In our paper the prevalence and thickness of the chert of the Carboniferous Limestone of Ireland is referred to. I have since had an opportunity of seeing the siliceous alteration of limestone on a very large scale, and in different formations, in the tropical region of Western Australia, when engaged there as Government Geologist. It is seen in the Lower Silurian, Carboniferous, and Upper Tertiary deposits. The transition from the limestones into chert, flint, and calcedony, is clearly visible in many places where these minerals form ranges often miles in extent, and where the thickness of the flinty material occasionally reaches 300 feet.

It is curious that these flint beds nearly always form the capping of the hills, but that they are of the same formation as the underlying limestone is proved by the gradual passage of that rock into flint; and where fossils occur in the limestone similar fossils are observed in the flint, until they become obliterated towards the summit.* I am inclined to attribute this to the action of highly-heated *rain-water* since the rocks have been deposited. In the warm season—which is also the rainy season, from about November to March—the rocks become intensely heated, and consequently, also the water lying in pools and cavities. I have been assured by settlers who have had to wade through flooded country, that at such times they could hardly endure the heat of the water, and I have experienced this to a slight extent myself. It is certain that under these circumstances silica would be more largely dissolved from one part, and more quickly deposited in another portion of the same rock; it is in fact on similar reasoning—the influence of sunlight and heat—that Professor Martin Duncan, F.R.S., explains the silicification of the West Indian Miocene Corals.

* See 'Report on the Geology of the Kimberley District, W. Australia.' E. T. Hardman. Perth, W. A., 1885. P. 18.

Whether it be heated rain-water, or heated sea-water containing silica, the principle of the transmutation is the same.

These siliceous beds are found, not only in the marine Silurian (and possibly older) beds of tropical Australia, in which sponges are comparatively rare, and in the Carboniferous rocks, but also in a fresh-water deposit which caps a hill south of Mount Elder on the Ord River, and about 500 feet above the level of the country, showing that it must at one time have been the bed of a very extensive lake. The upper beds are white limestone merging upwards as usual into flint, calcedony, and green agates. These are 50 feet thick, and all abound in a fossil, *Planorbis*, as determined by Professor McCoy, of Melbourne University, who named it as a new species, *Planorbis Hardmani*. His decision was confirmed by R. Etheridge, Junr., and Dr. Woodward, and the specimens are at present in the Museum at South Kensington.

This rock is simply one mass of *Planorbis* shells all highly silicified. I can hardly conceive that it was formed from sponge spicules, especially as according to Ernst Haeckel ('History of Creation,' p. 139) the main class of the Sponges lives in the sea, with the single exception of the green fresh-water Sponge (*Spongilla*).

It is not probable then that these organisms would have existed in these regions in sufficient numbers to form a rock 50 feet thick and over two miles square at present.

We have therefore examples at both ends of the scale in this one country showing how improbable is the Sponge theory of chert.

III. "On the Homologies and Succession of the Teeth in the Dasyuridæ, with an Attempt to trace the History of the Evolution of Mammalian Teeth in general." By OLDFIELD THOMAS, British Museum (Natural History). Communicated by Dr. ALBERT GÜNTHER, F.R.S. Received April 4, 1887.

(Abstract.)

The true homologies of the different teeth in the Marsupialia, and especially in the *Dasyuridæ*, have long been in a state of confusion, largely owing to their perplexing superficial resemblances to the teeth of the Carnivora and other Placentals, and to the incorrect homologies thereon founded. This confusion has been chiefly in regard to the premolars, of which some members of the family have two, others three, while generalised Placentals have four, and it is therefore necessary to prove which teeth have been successively lost in order to find out the correct homologies of the remainder.